Global Interagency IPY Polar Snapshot Year

Satellite observations are revolutionizing our ability to observe the poles and polar processes. No other technology developed since the International Geophysical Year (IGY) of 1957–1958 provides the high-resolution, continental-scale, frequent-repeat, and all-weather observations available from spaceborne sensors. The utility of that technology is evidenced by associated scientific advances including measurements of trends in polar sea ice cover and extent, the realization that the polar ice sheets can change dramatically at timescales of decades or less, and the quantification of relationships between processes at the poles and at middle and equatorial latitudes.

There are similar successes in the commercial and governmental sectors, and so the competition for access to the international constellation of satellites becomes increasingly more intense. Frequently, this means that there are only limited opportunities for conducting large-scale projects that consume a significant fraction of system capabilities for some dedicated period of time. One example of a large-scale coordinated effort is the Radarsat Antarctic Mapping Project (RAMP). RAMP required months of dedicated satellite and ground support time to achieve its objective of obtaining near-instantaneous, high-resolution snapshots of Antarctica.

Large-scale coordinated experiments using the latest spaceborne technology will be vital for some projects during the upcoming International Polar Year (IPY) in 2007–2008 (http://www.ipy.org). These projects have been designed to increase understanding of the role of polar processes in climate change, the contribution of glaciers and the polar ice sheets to sea level, the diminishing Arctic sea ice cover, and the properties of permafrost, variability in seasonal snow cover, and lake and river ice dynamics.

These IPY projects will be further enhanced if complementary observations and data analysis from different satellite sensors (Figure 1) can be coordinated. These satellites and instruments include, for example, Moderate Resolution Imaging Spectroradiometer (MODIS); Medium Resolution Imaging Spectrometer (MERIS); Advanced Along-Track Scanning Radiometer (AATSR); Multiangle Imaging Spectroradiometer (MISR), Ice, Cloud, and land Elevation Satellite (ICEsat); Radarsat-1 and Radarsat-2 synthetic aperture radar; Advanced Land Observing Satellite Phased Array type L-band Synthetic Aperture Radar (ALOS PALSAR) and Panchromatic Remote-sensing Instrument for Stereo Mapping (PRISM); TerraSAR-X synthetic aperture radar; Radar Imaging Satellite (RISAT); Envisat Advanced Synthetic Aperture Radar (ASAR); Meteorological Operational Satellite Programme (MetOp) Advanced Scatterometer (AScat); and the European Space Agency's new Gravity Field and Steady-State Ocean Circulation Explorer (GOCE) and Soil Moisture and Ocean Salinity (SMOS) Earth Explorer missions.

Coordination across the broad range of spatiotemporal and spectral scales of the required observations (Figure 2) is challenging in part because of resource allocation issues and in part because space programs are operated by a host of national and international agencies. To overcome those challenges, the international polar science community is building a science plan for coordinated spaceborne observation of the polar regions and polar processes as part of the International Polar Year and as part of the Integrated Global Observing Strategy (IGOS) Cryosphere theme implementation (http://igos-cryosphere.org/).

Part of the IPY coordination is being carried out through the project entitled Global Interagency IPY Polar Snapshot Year (GIIPSY; http://www-bprc.mps.ohio-state.edu/rsl/GIIPSY), which is endorsed by the World Meteorological Organization/International Council of Scientific Unions (WMO/ICSU) Joint Committee for the IPY. GIIPSY will advance polar science by facilitating the capture of IPY snapshots of processes in the Arctic and Antarctic against which past and future environmental changes in the polar ice, ocean, and land can be gauged. The technical objective for GIIPSY is to coordinate polar observations with spaceborne instruments and facilitate the delivery of derived data to the international science community. Acquisitions must be tailored to concentrate on those science problems that would best be served by a focused, time-limited data acquisition campaign and/or those problems that would be served by having a diverse but integrated set of observations.

Thus far, GIIPSY has developed a comprehensive set of science requirements for IPY spaceborne observations of ice sheets, glaciers, seasonal snow cover, sea ice, lakes and river ice, and permafrost. GIIPSY also has identified technological requirements on downlink and processing capabilities and has suggested where new technologies are required. These scientific and technical requirements are intended to complement the requirements set forth in approved IPY investigations and compiled by the IPY Subcommittee on Observations (SCOBS), and to help identify gaps in critical legacy data sets.

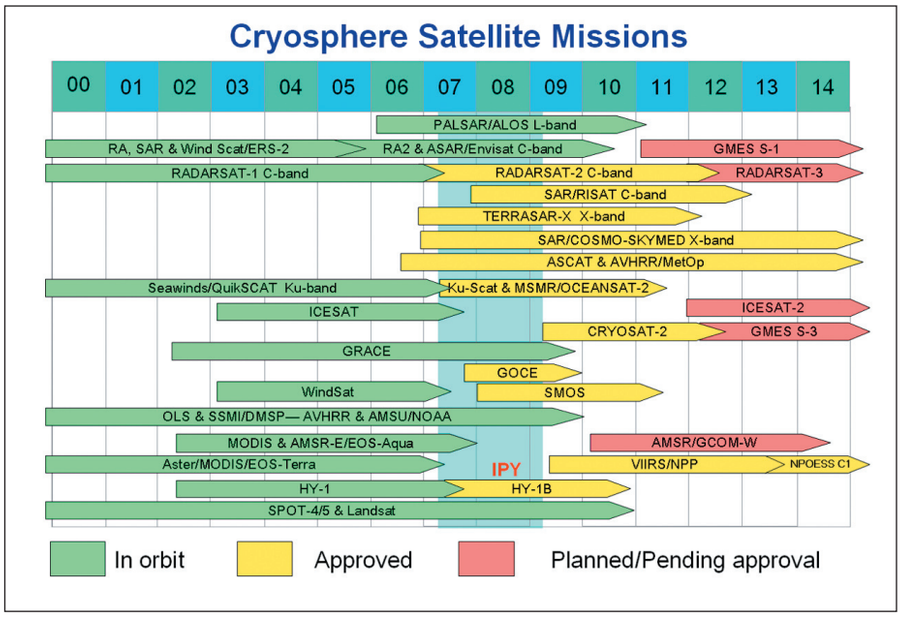

Fig. 1. Earth observing satellites planned to be operating during the International Geophysical Year.

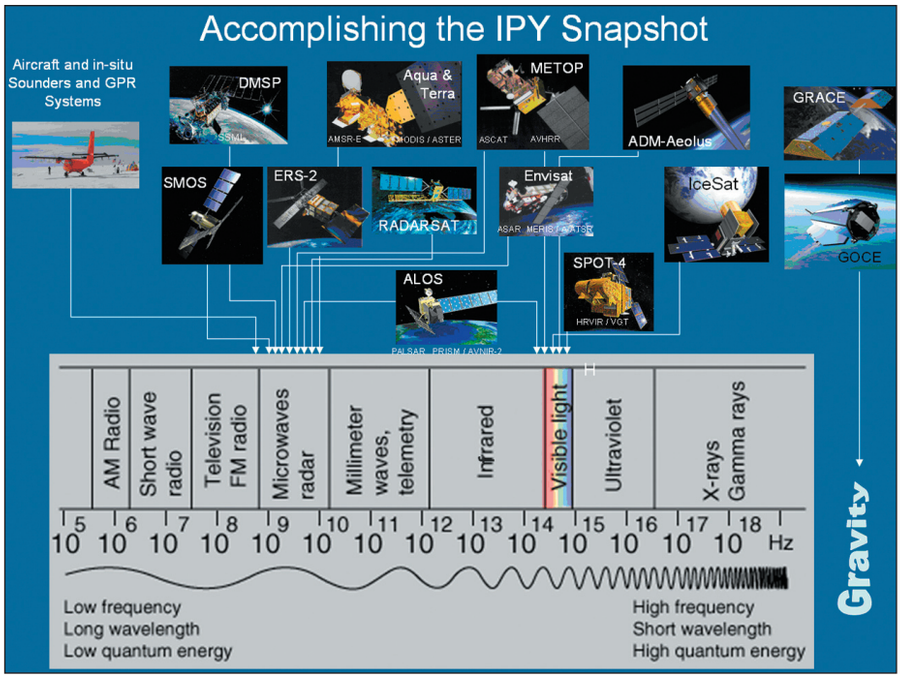

Fig. 2. Spectral range of Earth observing satellites planned to be operating during the International Geophysical Year (not exhaustive).

The project, thus far, has provided, through Mark Drinkwater, scientific guidance to a 2006 European Space Agency Announcement of Opportunity for IPY data acquisitions and processing, and GIIPSY is working with the Canadian Space Agency to develop a strategy for processing the Radarsat-1 archival data set. GIIPSY is also working with the SCOBS to convene an IPY Space Task Group (STG) in January 2007 in the World Meteorological Organization headquarters. Representatives from all of the space-faring nations will be invited to participate. The goal of the meeting is to present IPY observational requirements and to develop an acquisition plan that best utilizes the international constellation of Earth observing satellites while balancing the burden of acquisition, processing, and distribution across the international flight agencies.

Additional details can be found on the GIIPSY Web site (http://www-bprc.mps.ohio-state.edu/rsl/GIIPSY).

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